Northern Territory Naturalist (2007) 19: 54-57

Some notes on polyads and seed set of some northern Australian species of *Acacia*

Philip Short

Northern Territory Herbarium, PO Box 496,
Palmerston, NT 0831.

Introduction

The majority of plant species produce single pollen grains but there are many taxa in which pollen grains are commonly held together in multiples of four, the multi-grained structures being referred to as polyads. Polyads are found in the genus *Acacia*, with any one species usually producing a constant number of pollen grains per polyad. Kenrick and Knox (1989) reported that 90% of Australian species they surveyed have 16-grain polyads, with 4-, 8- and 12-grain polyads in the remainder. Macphail and Hill (2001) noted that 10-grain polyads also occur in Australia. Some species are polymorphic for grain number, variation occurring in individuals and between populations.

Once a polyad is fixed in the cup-shaped stigma the chances of other polyads attaching themselves to a stigma are low (*e.g.* Kenrick & Knox 1982, Kenrick & Knox 1989, Moncur *et al.* 1991). For example, in *A. mearnsii* (native to SE Australia) less than ten percent of stigmas have more than one polyad per stigma (Moncur *et al.* 1991). Furthermore, the number of ovules per ovary in species of *Acacia* seems to range from 2 to 15 (Kenrick & Knox 1982, Kenrick & Knox 1989) and the number of grains/polyad is correlated with ovule number. Published information suggests that the number of grains generally exceeds the number of ovules (*e.g.* 4:1 to 4:3 in *A. baueri*, 16:7 in *A. suaveolens*). Even when ovule number is slightly higher (8 grains:10 ovules in *A. mitchellii* and *A. paradoxa*) there is apparently no record (at least in natural populations) of seed set per pod ever exceeding the number of grains in a single polyad.

With these facts in mind, and aware that many northern Australian species have not been examined in regard to grains/polyad and seed set, in 2001 I examined herbarium specimens of some species found in the Northern Territory. Furthermore, in May of that year, during a training camp for National Park (NT) rangers held in the Victoria River, some rangers kindly helped to count seed set in shrubs of *A. conjunctifolia*. The results are presented here.

Methods and Results

For all species the number of seeds per fruit were determined from herbarium specimens housed in the Northern Territory Herbarium (DNA). Depending on the number of fruit present, one or more counts were determined from each specimen. The total number (n) of fruit counted for seed set is shown in Table 1, as is the total number of herbarium specimens examined.

The number of pollen grains per polyad was determined for one or two specimens of each species; the voucher specimens from which numbers were ascertained are indicated in Table 1.

For *A. conjunctifolia*, seed set was recorded for five shrubs growing within 20 metres of each other at Joe Creek, c. 5 km W of the Victoria River Crossing, Victoria Highway. More than 70 fruit were examined from each shrub and the results are summarised in Table 2.

Table 1. Pollen grains per polyad and fruit set of some Top End species of *Acacia* as determined from herbarium specimens.

Taxon	Grains per polyad; voucher(s)	Seeds per fruit mean ± SD (range)
Subgenus *Acacia*		
A. pachyphloia W.Fitzg. & Maiden	16; *Egan 2531*	4.86 ± 1.75 (2-8) n = 14 (specimens 8)
A. pallidifolia Tindale	16; *Barritt 2029*	3.66 ± 1.95 (1-8) n = 24 (specimens 8)
Subgenus *Heterophyllum*		
Section *Juliflorae*		
A. conjunctifolia F.Muell.	16; *Tindale 10153*	8.2 ± 1.91 (3-11) n = 30 (specimens 15)
A. megalantha F.Muell.	12; *Menkhorst 334* 12, 16; *Sivertsen 742*	7.24 ± 1.77 (4-12) n = 54 (specimens 16)
A. pellita O.Schwarz	16; *Brock 102, King 118*	7.92 ± 2.61 (3-12) n = 25 (specimens 8)
Section *Lycopodiifoliae*		
A. lycopodiifolia A.Cunn. ex Hook.	16; *Cowie 6266, Cowie 6317*	5.12 ± 2.52 (1-12) n = 199 (specimens 58)
Section *Phyllodineae*		
A. alleniana Maiden	16; *Russell-Smith 639*	7.39 ± 2.72 (1-13) n = 252 (specimens 39)
Section *Plurinerves*		
A. hemignosta F.Muell.	12, 16; *Brock 11*	4.9 ± 2.2 (1-12) n = 89 (specimens 12)

Table 2. The number of seeds per pod obtained from five bushes of *Acacia conjunctifolia*, a species with 16 pollen grains per polyad. n = number of fruit examined.

Plant	1	2	3	4	5
mean	7.21	7.78	8.56	8.97	9.15
SD	2.82	2.16	1.85	2.45	1.88
range	2–13	1–12	3–11	2–12	4–12
n	79	73	75	76	75

Discussion

Given the results of the survey by Kenrick and Knox (1982), the fact that all eight species examined here produce 16-grain polyads is not surprising. That *A. megalantha* and *A. hemignosta*, also produce 12-grain polyads is of interest in that their formation is sometimes associated with taxa of hybrid origin. For example, the Victorian species *Acacia grayana* produces 8-, 12- and 16-grain polyads and is a known hybrid between *A. brachybotrya*, which has 8-grain polyads, and *A. calamifolia* with 16-grain polyads (Leach & Whiffin 1978).

Whether the 12-grain polyads are associated with hybridity in *A. hemignosta* and *A. megalanthera* is beyond the scope of this note. However, *A. hemignosta* is widespread in northern Australia and exhibits considerable morphological variation (Pedley 1978, Cowan & Maslin 2001), suggesting the possibility of hybridization. In contrast, Pedley (1978) made no mention of any unusual variation in *A. megalanthera* and he considered the species to have no close relative. Tindale and Kodela (2001) also referred to the large individual flowers on interrupted spikes as readily defining *A. megalanthera*, but did note that a specimen from Keep River had particularly large leaves and spikes.

Macphail and Hill (2001) indicated that species with 12-grain polyads are to date only known from south-west Western Australia. Clearly, some species in northern Australia also produce them.

For all species examined the number of seeds set per pod never exceeded the maximum number of grains per polyad found in any species, results consistent with those obtained by others. The variation in seed set, rarely only one per pod and averaging less than ten per pod for every species examined, is also consistent with data presented for other species by Kenrick and Knox (1982, 1989).

References

Cowan R.S. and Maslin B.R. (2001) *Acacia hemignosta* F.Muell. *Flora Australia* 11B, 143.

Kenrick J. and Knox R.B. (1982) Function of the polyad in reproduction of Acacia. *Annals of Botany* 50, 721–727.

Kenrick J. and Knox R.B. (1989) Pollen–pistil interactions in Leguminosae (Mimosoideae). In *Advances in Legume Biology*.(eds C.H. Stirton and J.L. Zarucchi), *Monographs in Systematic Botany from the Missouri Botanical Garden* 29: 127–156.

Leach G.J. and Whiffin T. (1978) Analysis of a hybrid swarm between *Acacia brachybotrya* and *A. calamifolia* (Leguminosae). *Botanical Journal of the Linnean Society* 76, 53–69.

Macphail M.K. and Hill R.S. (2001) Fossil record of *Acacia* in Australia: Eocene to Recent. *Flora Australia* 11A, 13–29.

Moncur M.W., Moran G.F. and Grant J.E. (1991) Factors limiting seed production in *Acacia mearnsii*. In *Advances in Tropical Acacia Research* (ed. J.W. Turnbull), *Australian Centre for International Agricultural Research* 35, 20–25.

Pedley L. (1978) A revision of *Acacia* Mill. in Queensland. Part 1. *Austrobaileya* 1, 75–234.

Tindale M.D. and Kodela P.G. (2001) *Acacia megalantha* F. Muell. *Flora Australia* 11B, 184–185.

In the flowers of many *Acacia* species, the pollen grains are held together in clusters known as polyads. (Russell Willis)